ENGLISH TRANSLATION OF THE INTERNATIONAL APPLICATION

FOR NATIONAL PHASE SUBMISSION

Claims

1. Control method for an actuator (1-4) of an injector of a fuel injection system for an internal combustion engine, which method has the following steps:

- specifying a target value (SOI_{SOLL}) for the start of injection, and
- electrically controlling the actuator (1-4) at a specific trigger time ($t_{TRIGGER}$) with a specific actuator energy (E),

c h a r a c t e r i z e d b y

the following steps:

- detecting an actual value ($SOI1_{IST}$, $SOI2_{IST}$, $SOI3_{IST}$, $SOI4_{IST}$) at the start of injection,
- determining a deviation ($\Delta SOI1$, $\Delta SOI2$, $\Delta SOI3$, $\Delta SOI4$) between the target and actual values at the start of injection, and
- setting the actuator energy (E) as a function of the deviation ($\Delta SOI1$, $\Delta SOI2$, $\Delta SOI3$, $\Delta SOI4$) between the target and actual values at the start of injection for controlling the start of said injection.

2. Control method according to claim 1

c h a r a c t e r i z e d i n t h a t

controlling takes place jointly for a plurality of actuators (1-4) by setting the actuator energy (E) jointly for a plurality of actuators (1-4).

3. Control method according to claim 2

c h a r a c t e r i z e d b y

the following steps:

- detecting the actual value ($SOI1_{IST}$, $SOI2_{IST}$, $SOI3_{IST}$, $SOI4_{IST}$) at the start of injection separately for the individual actuators (1-4),
- determining the deviation (ΔSOI1, ΔSOI2, ΔSOI3, ΔSOI4) between the target and actual values at the start of injection separately for the individual actuators (1-4),
- determining the mean deviation (ΔSOI) between the target and actual values at the start of injection for a plurality of actuators (1-4), and
- setting the actuator energy (E) jointly for a plurality of actuators (1-4) according to the mean deviation (ΔSOI) between the target and actual values at the start of injection.

4. Control method according to claim 1
c h a r a c t e r i z e d i n t h a t
controlling takes place individually for in each case one of a plurality of actuators (1-4), with the actuator energy (E) being set in each case on an actuator-specific basis.

5. Control method according to claim 4
c h a r a c t e r i z e d b y
the following steps:
- detecting the actual value ($SOI1_{IST}$, $SOI2_{IST}$, $SOI3_{IST}$, $SOI4_{IST}$) at the start of injection separately for the individual actuators (1-4),
- determining the deviation (ΔSOI1, ΔSOI2, ΔSOI3, ΔSOI4) between the target and actual values at the start of injection separately for the individual actuators (1-4), and
- setting the actuator energy (E) separately for the individual actuators (1-4) as a function of the respective

actuator-specific deviation (ΔSOI1, ΔSOI2, ΔSOI3, ΔSOI4) between the target and actual values at the start of injection.

6. Control method according to one of the preceding claims characterized in that
the trigger time ($t_{TRIGGER}$) for controlling the actuators (1-4) is set independently of the deviation (ΔSOI1, ΔSOI2, ΔSOI3, ΔSOI4) between the target and actual values at the start of injection.

7. Control method according to one of claims 1 to 5 characterized in that
as part of controlling and in addition to setting the actuator energy (E), the trigger time ($t_{TRIGGER}$) is also set as a function of the deviation (ΔSOI1, ΔSOI2, ΔSOI3, ΔSOI4) between the target and actual values at the start of injection for controlling said start of injection.

8. Control method according to claim 7 characterized in that
the actuator energy (E) is set jointly for a plurality of actuators (1-4) while the trigger time is set separately for the individual actuators (1-4).

9. Control method according to one of the preceding claims characterized in that
the actual value ($SOI1_{IST}$, $SOI2_{IST}$, $SOI3_{IST}$, $SOI4_{IST}$) at the start of injection is detected by means of a seat contact switch (6-9), with said seat contact switch (6-9) detecting a valve needle position of the injector.

10. Control method according to one of the preceding claims c h a r a c t e r i z e d i n t h a t
the actuator energy (E) is set within the scope of controlling on a discrete time and/or on a discrete value basis.

11. Control device for an actuator (1-4) of an injector for a fuel injection system of an internal combustion engine, which device has
- a controlling element (5, 5.1-5.4) for electrically controlling the actuator (1-4) at a specific trigger time ($t_{TRIGGER}$) with a specific actuator energy (E)

c h a r a c t e r i z e d b y
- a measuring device (6-10) for detecting an actual value ($SOI1_{IST}$, $SOI2_{IST}$, $SOI3_{IST}$, $SOI4_{IST}$) at the start of injection,
- a first controller (16, 16.1-16.4) for setting the actuator energy (E) as a function of a deviation ($\Delta SOI1$, $\Delta SOI2$, $\Delta SOI3$, $\Delta SOI4$) between the measured actual value ($SOI1_{IST}$, $SOI2_{IST}$, $SOI3_{IST}$, $SOI4_{IST}$) at the start of injection and a pre-specified target value (SOI_{SOLL}) at the start of injection.

12. Control device according to claim 11
c h a r a c t e r i z e d i n t h a t
the actuator energy (E) can be set jointly within the scope of controlling for a plurality of actuators (1-4).

13. Control device according to claim 12
c h a r a c t e r i z e d b y
a computing unit (15) for calculating a mean value (ΔSOI) of the deviation ($\Delta SOI1$, $\Delta SOI2$, $\Delta SOI3$, $\Delta SOI4$) between the target and actual values at the start of injection for a plurality of actuators (1-4), with the first controller (16) setting the

actuator energy (E) for a plurality of actuators (1-4) in keeping with the mean value (ΔSOI).

14. Control device according to claim 11
characterized in that
the actuator energy (E) can be set individually within the scope of controlling for a plurality of actuators (1-4).

15. Control device according to one of claims 11 to 14
characterized by
a second controller (18) for setting the trigger time ($t_{TRIGGER}$) for controlling the actuator (1-4) as a function of the deviation (ΔSOI1, ΔSOI2, ΔSOI3, ΔSOI4) between the measured actual value ($SOI1_{IST}$, $SOI2_{IST}$, $SOI3_{IST}$, $SOI4_{IST}$) at the start of injection and the pre-specified target value (SOI_{SOLL}) at the start of injection.

16. Control device according to one of claims 11 to 15
characterized in that
the measuring device (6-10) has a seat contact switch 69) which detects a valve needle position of the injector.